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ABSTRACT

This paper presents cognitive strategies as one major approach to pain management. They are discussed as part of a trimodal system of pain management that also includes behavioral manipulations and physical intervention. The need for a standardized classification to deal with terminological inconsistency in the literature on cognitive management of pain is discussed, and a taxonomy of pain management strategies is proposed. The taxonomy offers a framework for comparison of strategies and their differing effects. Cognitive strategies are defined as techniques that influence pain through the medium of thoughts or cognitions. Three strategy categories are discussed: (1) imagery, which is subdivided into compatible emotive imagery and incompatible sensory imagery; (2) self-statements, which may be coping or reinterpretative; and (3) attention-diversion, which may be active or passive. (JAC)

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A NEW TAXONOMY OF COGNITIVE STRATEGIES FOR THE MANAGEMENT OF PAIN

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Introduction

It is widely acknowledged that psychological variables exert a significant influence on pain (e.g. Merskey & Spear, 1967; Turk, Meichenbaum & Genest, 1983; Weisenberg, 1977). Among those variables implicated are anxiety (Beecher, 1972; Hill, Kornetsky, Flanary & Wikler, 1952), predictability (Badia, Mchane, Suter Lewis, 1966; Staub, Tursky & Schwartz, 1971), perceived controllability (Bowers, 1968; Girodo & Wood, 1979), attention (Blitz & Dinnerstein, 1971; McCaul & Haustvedt, 1982), personality attributes (Lynn & Eysenck, 1961; Sternbach, 1974) and socio-cultural factors (Weisenberg, Kreindler, Schachat & Werboff, 1975; Sternbach & Tursky, 1965). Inasmuch as psychological factors influence pain, it should be possible to alleviate pain by manipulating such factors. 'Cognitive strategies' represent one such major approach to the management of pain.

'Cognitive Strategies' as Part of a Trimodal System of Pain Management

As illustrated in Table 1, 'cognitive strategies' may be seen as part of a trimodal system of pain management that also includes 'behavioral manipulations' and 'physical intervention'. Based on Jaremko (1978) and Turk and Genest (1979), cognitive strategies refer to techniques that influence pain through the medium of one's thoughts or cognitions. The cognitive strategy of pain control is a covert one and it may be self-

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initiated. Examples are imagery, self-statements and attention-diversion.

[INSERT TABLE 1 ABOUT HERE]

Behavioral manipulations refer to techniques which alter pain through the modification of overt action or a combination of behaviors and cognitions. They are initially at least, under some degree of external control (e.g., the hypnotist or the biofeedback therapist). As indicated in Table 1, this degree of external control varies with the particular kind of behavioral manipulation employed : in the case of hypnosis, control may be very externalized, whereas in the case of perceived controllability, the subject may experience a greater degree of self-control.

Finally, the trimodal system of pain management includes 'physical intervention'. In contrast to the cognitive and behavioral methods, the medium of intervention here is the body, and control is largely external to the subject (as in the case of physiotherapy, chemotherapy and surgery).

A Taxonomy of Cognitive Strategies

A major difficulty in reviewing the literature on cognitive management of pain is the terminological inconsistency. Several authors have employed different terms in referring to the same

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strategies. An example is the strategy of isolating a non-painful feature of a noxious stimulus to focus on (e.g., focusing on the thermal properties of cold pressor pain) : Blitz and Dinnerstein (1971) have referred to this as 'dissociation', Crais, Best and Best (1978) merely refer to it as 'focused attention', while Rybstein-Blinchik (1979) would call it 'somatization'. Similarly, what is termed 'rationalization' by Jaremko (1978) is vaguely termed 'cognitive reappraisal' by Langer, Janis and Wolfer (1975); and that which Baers and Karoly (1979) label 'incompatible imagery' is classed as 'selective attention' by Thelen and Fry (1981), whilst Spanos, Horton and Chaves (1975) refer to it simply as a 'strategy inconsistent with pain'.

The problems attendant upon such inconsistencies suggest the need for a standardized classification system for cognitive strategies. Any meaningful evaluation of the comparative effectiveness of different strategies, depends on the availability of such a standardized system. In response to this need, a taxonomy of cognitive strategies was developed and is presented in Table 2.

[INSERT TABLE 2 ABOUT HERE]

As shown, the various cognitive strategies may be classified into three broad divisions, namely, imagery, self-statements and attention-diversion. These in turn are divided into subcategories each of which will be described and illustrated.

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Imagery

Imagery strategies revolve around the production of particular images with pain-attenuating potential. These comprise (incompatible) imagery of events inconsistent with pain, and transformative imagery which seeks to modify specific features of the very pain experience. Incompatible imagery in turn subdivides into incompatible emotive imagery and incompatible sensory imagery.

Incompatible emotive imagery is designed to elicit emotions or affective reactions inconsistent with pain. As indicated in Table 2, one documented example of such imagery is found in a study by Westcott and Horan (1977) in which subjects under cold pressor stimulation generated images of anger associated with an imagined argument with a professor who had unfairly failed them in an exam and befriended a cheater. Similarly, images of 'self-assertiveness', 'pride' and 'mirth' may be exploited as emotive imagery incompatible with pain (Lazarus & Abramovitz, 1962).

By contrast, incompatible sensory imagery centers around images of 'pure' visual, auditory or other sensations incompatible with pain but with no necessary link to particular emotions. As indicated in Table 2, imagining a hot day in the desert whilst undergoing cold pressor pain (Spanos, Horton & Chaves, 1975) is one example of this strategy. Similar imagery of 'hot days' to produce incompatibility with cold pressor pain have been employed

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by Blitz and Dinnerstein (1971), Jaremko (1978), Jaremko, Silbert and Mann (1981) and Ladouceur and Carrier (1983). Use of pleasant imagery to produce incompatibility with pain has also been reported (Clum, Luscomb & Scott, 1982; Strassberg & Kliner, 1972; Worthington & Feldman, 1981). Clinically, this imagery has often assumed the form of pleasant images of 'blue skies', 'grassy meadows' and 'gentle warmth' to ameliorate dental pain (Horan, Layng & Pursell, 1976) and the pain of childbirth (Horan, 1973; Stone, Demchik-Stone & Horan, 1977).

The second set of imagery strategies, transformative imagery, is designed to alter specific features of the pain experience. First, it may assume the form of contextual transformation in which the context or setting of the pain is altered in imagination. A classic example as reported in Table 2, is found in the Knox (1972) study in which subjects administered forearm ischemic pain imagined themselves as spies shot in the arm and escaping from enemy agents down a tortuous mountain road. In another study (Jaremko, Silbert & Mann, 1981), ischemic pain was managed by imagining the pain as occurring in the context of exertion during sport. Finally, in a clinical study (Langer, Janis & Wolfer, 1975), male surgical patients using contextual transformation as part of a wider treatment regimen, were required to imagine themselves playing an exciting football game during which they sustained a minor cut; female patients in the same condition imagined themselves receiving a similar cut in the process of finishing dinner preparations for a large group of people.

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Transformative imagery may also be such that the aspects of the situation being transformed are features of the stimulus producing pain (stimulus-transformative imagery). The clinical example referred to in Table 2 involving the visualization of abdominal pain as caused by tightening steel bands that could be loosened, is the best known example.

Finally, transformative imagery may also take the form of response-transformative imagery involving the imagination of response states that usually originate from the noxious stimulation itself, but which are dissociable from the ensuing pain. Thus, in the case of cold pressor stimulation, the subject is typically directed to focus on the "numbness" or just the "coldness" of the stimulated limb (Blitz & Dinnerstein, 1971; Evans & Paul, 1970; Scott & Leonard, 1978). Transformative imagery of numbness or insensitivity has also been used toward the alleviation of pressure pain (Barber & Calverley, 1969; Chaves & Barber, 1974). The relabelling of responses to noxious stimualtion in terms of a whole array of objective sensations such as numbness, pressure or pulsations has also been explored in studies by Ahles, Blanchard and Leventhal (1983), McCaul and Haushtvedt (1982), Rybstein-Blinchik (1979), Rybstein-Blinchik and Grzesiak (1979) and Scott and Barber (1977). In all these cases, reference to the notion of pain is avoided altogether.

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Self-Statements

The next major body of cognitive strategies involves periodic rehearsing of key statements to oneself, during the pain experience. Self-statements, as these are termed, may be of the 'coping' or 'reinterpretative' kind.

Coping self-statements make no attempt to modify nociceptive input, but emphasize the person's ability to withstand the pain. They have been used primarily in the context a treatment regimen known as Stress Inoculation (Meichenbaum & Turk, 1976). A different set of statements is usually employed at each stage of the pain experience e.g., 'You can develop a plan to deal with it' during the preparatory stage, 'Relax, you're in control' during the confronting stage, 'Just keep it manageable' during the critical stage, and also reinforcing statements such as 'Good, you did it' at the concluding stage. Such statements have formed the subject of investigation in studies by Horan, Hackett, Buchanan, Stone and Demchik-Stone (1977), Klepac, Hauge, Dowling and McDonald (1981), Turner (1982), Worthington (1978) and Worthington and Shumate (1981).

Whilst coping self-statements make no attempt to modify nociceptive input, reinterpretative self-statements are aimed at negating the unpleasant aspects of nociceptive stimulation. This typically incorporates the use of defense mechanisms such as denial or rationalization. Denial-oriented reinterpretative self-statements may for instance require subjects to deny the

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harmful and unpleasant features of radiant heat stimulation and even regard it as pleasurable (Neufeld, 1970). Rationalization-oriented reinterpretative self-statements may require subjects to think of positive aspects of a pain experiment such as the course credit obtainable (Jaremko, 1978), or in the case of surgical patients, the compensatory aspects of the painful experience, like receiving extra care and attention, improving in health, and even weight loss if appropriate (Langer, Janis & Wolfer, 1975).

Attention-Diversion

The third and final set of cognitive strategies, attention-diversion, deals with the directing of attention to a non-noxious event or stimulus in the immediate environment in order to achieve distraction from concurrent pain. This ranges on a continuum from a passive redirecting of attention to a distractor sti mulus (passive distraction) to active attention-diversion that requires more complex and involved interaction with the distractor as is necessitated in the performance of a distractor task.

Passive distraction, thus, may merely involve the use of scenic slides as a visual distractor from pain (Berger & Kanfer, 1975; Kanfer & Goldfoot, 1966; Kanfer & Seidner, 1973; McCaul & Haushtvedt, 1982). Alternatively, auditory stimuli have been employed to distract subjects from pain (Gardner, Licklider Weisz, 1960; Melzack, Weisz & Sprague, 1963). Clinically, passive

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distraction has often taken the form of focusing on conspicuous 'dots' presented as a distractor from childbirth pains (Stevens, 1977; Stevens & Heide, 1977; Stone, Demchik-Stone & Horan, 1977).

The active attention-diversion which involves a more complex interaction with the distractor, is usually promoted by the active performance of some competing task during pain. Thus, Barber and Cooper (1972) had subjects add aloud, and Beers and Karoly (1979) had subjects count backwards from 1000 in steps of three, as a means of achieving distraction from pain. More 'involved' tasks are reported by Brucato (1978) who presented a range of mathematical problems to subjects in cold pressor pain, and by Spanos, Stam and Brazil (1981) who required subjects to perform a pursuit rotor task during cold pressor stimulation.

Critical Appraisal of the New Taxonomy

It is apparent from the foregoing section that the proposed taxonomy is quite exhaustive in nature. There is hardly a cognitive strategy reported in the pain literature that resists classification in this taxonomy. This attests to the comprehensiveness of the taxonomy. Further, the various categories within the taxonomy are mutually exclusive; even in the few instances where common elements obtain in different strategies, these elements are combined in different proportions, thus preserving the mutual exclusiveness.

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Conclusion

The proposed taxonomy offers much potential value toward the study of cognitive strategies for pain. It affords a standardized system for conceptualizing and referring to the gamut of such strategies. It further provides some sort of framework for meaningful comparison of strategies, in terms of pain reduction. Finally, the systematic classification of strategies made possible by the present taxonomy, may also permit insight into the mediating processes responsible for differential effects of various strategies on pain. In sum, it is felt that this new taxonomy holds much promise for guiding the research and very conceptualization of cognitive strategies in pain management.

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Table 1 : The Trimodal System of Pain Management

1. Cognitive Strategies : involving thoughts, cognitions, private events; self-initiated.

   (i) Imagery, Fantasy (e.g. Horan, Layng and Pursell,1974)

   (ii) Self Statements (e.g., Worthington, 1978)

   (iii) Attention-Diversion (e.g., Kanfer and Goldfoot, 1966)

2. Behavioural Manipulations : involving actions, behaviours, public events; externally manipulated.

   High External Control

   (i) Hypnosis (e.g., Hilgard, 1971)

   (ii) Operant Conditioning (e.g., Fordyce, 1973)

   (iii) Modelling (e.g., Craig and Prkachin, 1978)

   (iv) Biofeedback (e.g., Nouwen and Solinger, 1979)

   Low External Control

   (i) Expectancy, Placebos (e.g., Scott and Leonard, 1978)

   (ii) Perceived Controllability (e.g. Corah and Boffa, 1970)

   (iii) Attribution (e.g., Nisbett and Schachter, 1966)

   (iv) Cognitive Dissonance (e.g., Zimbardo, Cohen, Weisenberg, Dworkin and Firestone, 1966)

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3. Physical Intervention : directly involving body; completely under external control.

(i) Physical relaxation, Physiotherapy (e.g., Grzesiak, 1977)

(ii) Concurrent tactile stimulation (e.g., Higgins, Tursky and Schwartz, 1971)

(iii) Transcutaneous Electrical Stimulation (e.g. Dorsch and Ruhle, 1980)

(iv) Acupuncture (e.g., Bowsher, Mumford, Lipton and Miles, 1973)

(v) Pharmacological Agents (e.g., Merskey and Hester, 1972)

(vi) Surgery (e.g., Fourman, 1967)

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Table II: A Taxonomy of Cognitive Strategies for Pain Management

Strategy	Description	Example
Imagery		
Incompatible Imagery		
Incompatible emotive imagery	Imagery that arouses certain emotions (e.g., mirth, self-assertion, anger and humour) which reciprocally inhibit pain.	During cold-pressor stimulation, subjects imagining themselves in an argument with a professor who has unfairly failed them (Westcott & Horan, 1977).
Incompatible sensory imagery	Imagery of "pure" visual, auditory, or other sensations, with no necessary link to particular emotions.	Imagining a hot day in the desert, whilst undergoing cold-pressor pain (Spanos, Horton & Chaves, 1975).
Transformative Imagery		
Contextual transformation	Imaginative transformation of the context or setting in which the pain occurs.	In the process of ischemic pain in the arm, imagining oneself as a spy shot in the arm, and escaping from enemy agents who pursue him down a tortuous mountain road (Knox, 1972).
Stimulus-transformative imagery	Imaginative transformation of the stimulus features producing pain.	In a clinical case of abdominal pain, visualizing the sensations as caused by tightening steel bands that can be loosened (Levendusky & Pankratz, 1975).
Response-transformative imagery	Imaginative transformation (or relabelling) of the sensations arising from noxious stimulation, without reference to the concept of pain.	In cold-pressor pain, dissociating the "coldness" from the "pain" and focusing only on the former (Blitz & Dinnerstein, 1971).

Table II (continued)

Strategy	Description	Example
Self-Statements		
Coping Self-Statements		
Stress Inoculation	A set of rational-emotive type statements that subjects rehearse within themselves, in trying to cope with different stages of the pain experience.	Subjects in ischemic pain resorting to coping statements such as "You can meet the challenge," "You were supposed to expect the pain to rise; just keep it under control." (Meichenbaum & Turk, 1976.)
Reinterpretative Self-Statements		
Denial	Self-verbalization, denying the existence of pain.	Thinking of "radiant heat pain" as being pleasurable and the experience as being enjoyable (Neufeld, 1970).
Rationalization	Self-verbalization, emphasizing only positive aspects of the experience.	Psychology undergraduates during cold-pressor stimulation, thinking of the course credit they would receive for participation in the experiment (Jaremko, 1978).
Attention-Diversion		
Passive Distraction	Diverting attention away from the pain, and passively redirecting it to a distractor stimulus.	Viewing slides during a cold-pressor test (Kanfer & Goldfoot, 1966).
Active Attention-Diversion	Diverting attention away from the pain, and directing it to the active performance of a distractor task.	Engaging in mental problem-solving, tasks, during cold-pressor stimulation (Brucato, 1978).